REMARKS

Applicant thanks the Examiner for the careful review of this application. Claims 16-37 were previously canceled without prejudice and claim 14 was also canceled without prejudice in this response. The specification was amended to add a patent application serial number. Claims 1-13 and 15 were amended to clarify the claimed embodiments. New claims 38-45 were introduced for consideration. No new matter was added. Therefore, claims 1-13, 15 and 38-45 are currently pending in this application.

RELATED APPLICATIONS

Applicant notes for the record that the present patent application is related to U.S. Patent Application No. 10/627,416, entitled "Ultrasonic Assisted Etch Using Corrosive Liquids", filed on July 24, 2003 (Attny Docket No. 59081-8007.US01).

REJECTIONS UNDER 35 U.S.C. § 112

Claims 2-5 and 13 were rejected under 35 U.S.C. § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, the Examiner is maintaining that the average surface roughness numbers require units of distance. Applicant respectfully traverses. In the Information Disclosure Statement that is accompanying this response, Applicant has supplied a reference that describes how the Ra parameter is used to define surface roughness. Withdrawal of the rejections of claims 2-5 and 13 is respectfully requested.

REJECTIONS UNDER 35 U.S.C. § 102(b)

Claims 1 and 6-7 were rejected under 35 U.S.C. § 102(b) as being anticipated by Matsushita (JP 50087974). Applicant respectfully traverses for the following reasons.

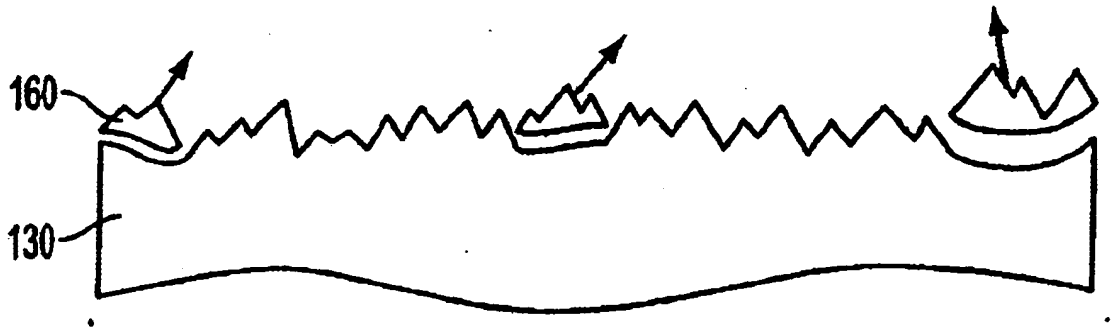
Matsushita apparently discloses an etch solution to increase surface area of fibers made from silica alumina-based materials.

Aspects of the claimed embodiments are directed to a method for treating a surface of a quartz substrate by ultrasonically acid-etching the work surface to increase the roughness by at least 10% but less than that which would create cracks under said working surface which would result in pieces disengaging from said working surface. Applicant respectfully submits that increasing the roughness of a work surface is the same thing as increasing the surface area. Matsushita discloses increasing the surface area of a workpiece "5-10" times as can be seen from reading Matsushita's abstract:

> **"Commercial alkaline glass fibres were immersed in HCL-5 vol. % HF mixt., trated with 100-1000 Hz ultrasonic wave for 20 min., and washed with H2O to give glass fibres have sp. surface area which ws 5-10 times the original sp. surface are."** – Matsushita, abstract.

In other words, Matsushita teaches to increase the surface area / roughness by 500% to 1000%. This particular range is detrimental to the goal of the claimed embodiments – to achieve a surface with an appropriate surface roughness for use in semiconductor fabrication equipment. The desirable surface needs to have a minimum roughness but on the other hand not be too rough as that can be detrimental as well, for example if cracks formed under the surface that could lead to pieces falling off. This is depicted in Fig. 1C and commented

on in Applicant's specification – both of which are repeated below for the Examiner's convenience:



> **"If the substrate surface is roughened too extensively, the thinner fabrication components may be penetrated by the blasting material. On the other hand, if the shield is blasted for long periods of time, the cleaning process may produce a relatively smooth surface, which readily allows materials to flake off onto the wafer. Alternatively, or in addition to these hazards, cracks may form below the surface of these extensively roughed substrates, particularly quartz, causing large pieces of the substrate to fall off during semiconductor manufacturing."** – Applicant's specification, page 12, lines 10-28.

While the above-quoted passage and figure are directed towards grit blasting, it is equally applicable to any method of roughening up a quartz surface such as through ultrasonic etching. Applicant respectfully submits that the time required to etch a piece of quartz to achieve Matsushita's stated requirements of achieving an increase of 500 to 1000% would render a piece of quartz unusable for further service in a semiconductor or similar processing environment.

Additionally, Matsushita's disclosure is directed towards increasing surface area of a silica or alumina-based catalyst support. In other words, glass fibres are etched in order to increase the surface as much as possible. Once the

desired surface area is achieved, the glass fibres are then coated with a catalyst material. Thus, the fibres are supporting the catalyst. It is a goal of Matsushita to increase the surface area as much as possible because that directly translates into an increased reaction surface area for the catalyst that is later applied. Again, the claimed embodiments only require the surface area to be increased to a certain range. Beyond the acceptable range and the surface will be detrimental to the manufacture of semiconductor products.

Furthermore, Matsushita is also directed towards the etching of long and very thin glass fibres. The claimed embodiments, on the other hand, are intended to be practiced on quartz that is commonly used on semiconductor manufacturing parts such as rods, tubes, crucibles, domes, chambers and bell jars as specified in Applicant's specification:

> **"The method has been shown to be particularly effective in cleaning contaminants from high purity quartz, which is commonly found in rods, tubes, crucibles, domes, chambers and bell jars. The method is also useful for cleaning contaminants from other semiconductor workpieces such as those including polysilicon and single crystal silicon, which can be found in chamber roofs, source rings, collars and wafers. Considered below are the steps of the method and apparatus useful for carrying out the method."** – Applicant's specification, page 10, lines 1-7

One trying to solve the problem of etching quartz on semiconductor manufacturing parts would naturally not look to Matsushita's disclosure of etching long and thin fibres of glass as the claimed embodiments are meant to roughen up quartz surfaces on variably shaped, larger semiconductor manufacturing equipment parts.

Also, Matsushita teaches ultrasonically etching at 0.1-1 kilohertz (100-1000 hertz). The claimed embodiments are generally meant to be ultrasonically etched in a different range, specifically at least about 18 kilohertz to up and beyond 2 megahertz as disclosed in the specification:

> **"As used herein, the term "ultrasonic" generally refers to acoustic disturbances in a frequency range above about eighteen kilohertz and which extend upwards to over two megahertz."** – Applicant's specification, page 9, lines 10-12.

In view of the foregoing, Applicant respectfully submits that Matsushita does not disclose the claimed embodiments. Withdrawal of the rejections of claims 1 and 6-7 is respectfully requested.

REJECTIONS UNDER 35 U.S.C. § 103(a)

Claims 1, 4-7, 12-13 and 15 were rejected under 35 U.S.C. § 103(a) as being anticipated by Gorczyca (U.S. Patent No. 6,438,410) in view of Buck (U.S. Patent No. 4,957,583. Claims 2 and 3 were rejected under 35 U.S.C. § 103(a) as being anticipated by Gorczyca (U.S. Patent No. 6,438,410) in view of Buck (U.S. Patent No. 4,957,583 and further in view of the admitted prior art. Claim 14 was rejected under 35 U.S.C. § 103(a) as being anticipated by Gorczyca (U.S. Patent No. 6,438,410) in view of Buck (U.S. Patent No. 4,957,583), Takahashi (U.S. Published Patent Application No. 2003/0091835), Somboli (U.S. Published Patent Application No. 2004/0000327) and Kiehlbauch (U.S. Published Patent Application No. 2004/0000327).

Gorczyca apparently discloses a semiconductor processing article for which its useful life has been extended. The article is used in a semiconductor furnace system, particularly in a low pressure chemical vapor deposition furnace for

prolonged periods without requiring cleaning to remove built-up film. The semiconductor processing article is a quartz body characterized by a surface roughness having a first component with an average deviation from a first mean surface of about 2.5 to 50 microns, and a second component with an average deviation from a second mean surface of about 0.25 to 5 microns. The processing article is prepared for use in the furnace by mechanically blasting and chemically etching the surface of the article.

Buck apparently discloses a wet etching process wherein the etchant bath is ultrasonically vibrated, preferably while a carrier member holding the workpiece to be etched is slightly agitated. An apparatus for practicing the process includes a first vessel for holding a coupling fluid; a second vessel for holding an etchant solution; means for suspending the second vessel in the coupling fluid of the first vessel; and an ultrasonic generator means coupled to the first vessel to impart ultrasonic vibrations to the coupling fluid and, via the coupling fluid and second vessel, to the etchant solution.

Takahashi apparently discloses a method for coating quartz parts such that the coating perhaps makes the quartz more suitable in semiconductor processing equipment.

Somboli apparently discloses an apparatus for washing quartz parts, particularly for process equipment used in semiconductor industries, comprising a process unit that is suitable to perform washing, a unit for managing washing and rinsing fluids, and a control unit, the units being mutually separate, the process unit comprising a bell-shaped element that is suitable to enclose

hermetically the quartz parts to be washed, the quartz parts being inserted vertically in the bell-shaped element.

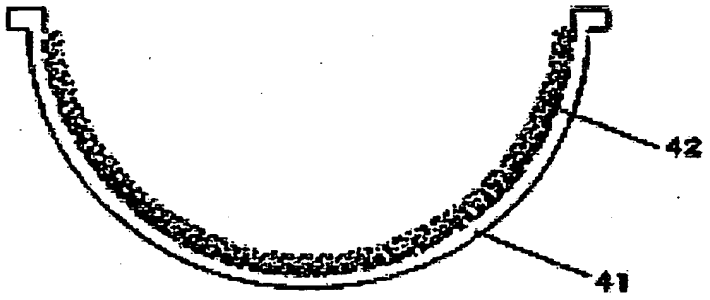
Kiehlbauch apparently discloses methods for surface finishing of a component useful for a plasma processing apparatus. The component includes at least one plasma-exposed quartz glass surface. The method includes mechanically polishing, chemically etching and cleaning the plasma-exposed surface to achieve a desired surface morphology. Quartz glass sealing surfaces of the component also can be finished by the methods. Plasma-exposed surface and sealing surfaces of the same component can be finished to different surface morphologies from each other.

Similar to the previous section, aspects of the claimed embodiments are directed to a method for treating a surface of a quartz substrate by ultrasonically acid-etching the work surface to increase the roughness by at least about 10% but less than that which would create cracks under said working surface which would result in pieces disengaging from said working surface. The various cited prior art documents do not disclose the claimed embodiments – alone or in combination.

Aspects of the claimed embodiments, such as those disclosed in independent claim 12, are also not disclosed via the cited prior art. Specifically, there is no teaching or disclosure for a final substrate cleaning process that includes a 10-30 minute soak in a hydrofluoric, nitric and water solution or spraying the substrate with a hydrofluoric, nitric and peroxide solution, rinsing

the substrate with deionized water for 5-15 minutes at 20-50 degrees C. and then ultrasonicating the substrate for 30 minutes at 38 to 46 degrees C.

Regarding the Takahashi reference, Takahashi apparently discloses coating quartz parts with a ceramic coating and then performing grit blasting and acid treatments to achieve a desired surface characteristic. Due to the nature of Takahashi's teachings, one trying to arrive at the claimed embodiments would naturally be dissuaded from utilizing this reference. Specifically, Takahashi requires for the quartz parts to be coated with a ceramic layer. This can be seen, for example, at Takahashi's Fig. 4:



As can be seen, a quartz bell jar 42 is coated with a thermal ceramic 42. The claimed embodiments do not require this extra coating step. As a result, Takahashi as a whole is not applicable to what the claimed embodiments are trying to accomplish – treating surfaces of quartz materials.

In a similar manner, the teachings contained in the Buck reference are geared towards fine pattern etching on product wafers. While there may be some similarities between the methods used to etch product wafers and methods

used to treat quartz surfaces, they are just that – similarities. Therefore, it also would be out of the ordinary to utilize the teachings of Buck to arrive at the claimed embodiments of treating quartz surfaces.

Those searching for an answer on how to properly roughen up a quartz surface would also tend to not look to Kiehlbauch for answers. Kiehlbauch discloses a process for treating quartz and the goal of that process is to remove particles and other contaminants from the quartz. Additionally, the process leaves a relatively smooth surface – a surface not rough enough to promote stiction of deposited materials. The process basically includes three steps: a mechanical processing step, a chemical etch step and a cleaning step. The mechanical processing step removes most particles and then the etching step removes the remaining contaminants. Since Kiehlbauch is not directed towards the goal of achieving an appropriate surface roughness to promote stiction of deposited layers and nor does it achieve that goal, Applicant respectfully submits that Kiehlbauch would not be a preferable guide to achieving the claimed embodiments.

In view of the foregoing, Applicant respectfully submits that the prior art cited by the Examiner does not disclose the claimed embodiments. Claim 14 was canceled and therefore the rejection of that claim is moot. Withdrawal of the rejections of claims 1-7, 12-13 and 15 is respectfully requested.

ALLOWABLE SUBJECT MATTER

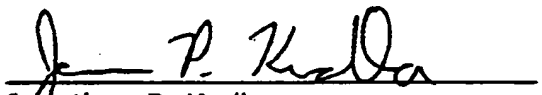
Applicant thanks the Examiner for noting the presence of allowable subject matter in this application, specifically claims 8-11. Claim 8 has been re-written into independent form including all of the limitations of any intervening dependent claims. Withdrawal of the objection of claims 8-11 is respectfully requested.

CONCLUSION

Applicant believes that all pending claims are allowable and a Notice of Allowance is respectfully requested. The amendment was made to expedite the prosecution of this application. Applicant respectfully traverses the rejections of the amended claims and reserves the right to re-introduce them and claims of an equivalent scope in a continuation application.

If the Examiner believes that a conference would be of value in expediting the prosecution of this application, he is cordially invited to telephone the undersigned counsel at the number set out below.

Respectfully submitted,
PERKINS COIE LLP



Jonathan P. Kudla
Reg. No. 47,724

Date: June 30, 2005

Customer No. 22918
Perkins Coie LLP
P.O. Box 2168
Menlo Park, CA 94026
Telephone: (650) 838-4300